MAINTENANCE ENGINEERING PROCEDURE

UNION CARBIDE CORPORATION
NUCLEAR DIVISION
OAK RIDGE GASEOUS DIFFUSION PLANT
OAK RIDGE, TENNESSEE 37830

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REMOVAL AND REPLACEMENT OF K-31 CONVERTER

A. SCOPE

This procedure describes the removal and replacement of a "00" converter in K-31. This method includes the exchange of converters for the CIP/CUP program.

C. QUALITY ASSURANCE

An assembled converter is highly sophisticated and quite expensive. Therefore, it must be handled and installed according to the specification guideline in K/GD-1854. Any deviation from the document must not occur unless approved by the Maintenance Converter Lead Engineer.

1. Barrier Protection

Failure to protect the barrier as specified in K/GD-1854 will reduce the overall production efficiency of the cascade converter. This document emphasizes the precautions and procedures that will lessen the quality losses that might otherwise occur.

2. Welding

Failure to produce good quality, leak-tight welds leads to considerable delay during leak acceptance tests. Faulty welds result in (1) release of process gas to the atmosphere, (2) inleakage into the process system, (3) formation of damaging corrosion product, and (4) cell off-stream time to repair the weld.

3. Equipment Preparation and Inspection

Converter piping must be prepared and inspected as described in applicable drawings, specifications, and procedures. Failure to do so leads to schedule delays and failure to meet production commitments.

4. Rigging and Equipment Handling

Failure to properly rig a converter seriously endangers human life and may cause extensive damage requiring costly repair to cascade equipment. Personnel must have an approved license before operating a crane to handle converters (MEP-302, "Certification of Industrial Equipment Operators").

PREPARED BY	APPROVED BY	REVIEWED FOR CLASSIFICATION
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5. Cleanliness

The presence of foreign materials in the process piping or converter cooler can cause subsequent cooler leaks and compressor inefficiency; consequently, this piping must be clean and free of oil, dirt, weld slag, and loose scale.

b Transporting

Comply with MEP-329, "Transporting of Compressors and Converters Between K-1401, K-1420, K-31, and K-33."

7. Quality Control Documentation

Complete form UCN-11968, "Process Converters - Field Data" for each (single) converter change.

B. SAFETY REQUIREMENTS

1. A Safety Work Permit (UCN-3694B), and Electrical Work Permit (UCN-513), and Burning Permit are required. The General Safe Practices listed in the ORGDP Safety and Health Standards apply, with particular emphasis on the following:

   a. Check location of Safety Work Permit and Electrical Work Permit against job location.

   b. Burning: Wear respirator and protective clothing.

   c. Grinding: Wear respirator, safety goggles, and protective face shield.

   d. Lifting converter with overhead crane:

      1) Only qualified and licensed operator operates crane.

      2) Use siren during operation.

      3) Use proper lifting fixture (refer to K-SS 6.2 of the Safety and Health Standards).

      4) Adjust lifting fixture to assure that converter is level.

   e. Keep floors free of cables, slings and other tripping hazards.

   f. Wear hard hat, safety glasses and ear protection while on cell floor.

2. Prior to delivery of any converter to K-1401 shop for modification, Chemical Operations personnel are requested to follow MEP-347.

D. RESPONSIBILITIES

1. Field Maintenance, Routine Maintenance Personnel

a. Confers with the Maintenance Lead Engineer on input information used in the Computerized Equipment Information System (CEIS).

b. Consults the Maintenance Lead Engineer on all converter nonconformance parts.

c. Removes and installs converters in K-31.

d. Contacts Cascade Operations for decontamination service, if required.

e. Makes sure each converter is tagged with either a "Material Transfer Radiation Clearance" tag (green) or a "Radiation Contamination" tag (yellow).

f. Fills out and forwards Process Converter - Field Data report to Maintenance Engineering.

g. Follows safety and industrial hygiene requirements.

h. Inspects the inside of converter and coolant and PG pipe openings to assure no foreign material is present.

i. Assures ET&I inspectors complete changeout inspection required.

2. Maintenance Lead Engineer:

a. Consults the Machine Design Engineer on all designed parts and specification standards.

b. Approves deviations and the use of nonconforming parts after consulting with the Mechanical Design Engineer.

c. Audits K-31 converter exchange.

3. Field Maintenance, PEM/PEU Personnel

a. Follows and completes applicable portions of PEM #602 (cell changeout check list).

b. Forwards completed cell changeout check list to general foreman, Cascade Maintenance.

c. Contacts Cascade Operations for cleaning and decontamination service.

d. Follows safety and industrial hygiene requirements.

4. Cascade Operations Personnel

a. Purges the cell for converter exchange.

b. Furnishes Field Maintenance with Electrical and Safety Work Permits.

c. Contacts Health Physics for consultation, advice, and placement of signed and dated Radiation Contamination tags on converters scheduled for removal.

d. Contacts Chemical Operations group for cleaning and decontamination service, if required.

5. Chemical Operations Personnel

a. Cleans excessive process material from converter, if required.

b. Notifies Cascade Operations and Field Maintenance after cleaning operations.

6. Health Physics Personnel

a. Consults with Field Maintenance on safe working limits for their employees.

b. Places signed and dated Radiation Contamination tags on converter being removed from the cascade.

7. Equipment, Test, and Inspection (ET&I)

a. Monitors and inspects the internal cleanliness, and quality of all welding performed.

b. Forwards welding inspection reports to Operations Engineering, Field Maintenance, and Maintenance Engineering.

E. GENERAL INFORMATION

1. K-31 converters are part of the cascade process system. This procedure covers the replacement of either a single converter or all converters in a complete cell changeout.

2. Since a converter removal requires taking a total cell from the cascade, it is necessary to complete the work as quickly as possible and yet maintain quality workmanship.

3. Pertinent information about the changeout (coolant leak, plugging, and damaged tube sheets) shall be documented on the Process Converters - Field Data cards. This form provides input data for the Computerized Equipment Information System (CEIS).

4. Follow an acceptable method of loading, unloading, and transporting a converter between Buildings K-1401, K-1420, and K-31 areas as described in MEP-329. This is extremely important for converter safety, care, protection, expediency, and compliance with ORGDP Health Physics.

5. When installing converters during the CIP/CUP, make sure they are the last cell component installed and begin installation with stage 1.

6. Assure that the converter internal air requirements are met. A dry air purge must be begun on the other components of each stage at least 30 minutes prior to installation of that stage's converter. The purge must continue throughout installation of all converters except when prohibited by welding.

7. All cell nozzles, pipings, and converter openings must remain covered with shower caps until the last possible moment.

8. Each converter's "storage covers" are to be removed in the aisle adjacent to the cell and replaced with a "draped" cover that prevents air drafts into the nozzles while at the same time allowing the converter to be set in place without having to remove the "draped" cover. If the converter B-outlet nozzle is not going to be "mated" at the same time as the other nozzles, the regular "storage covers" should not be removed in the aisle but, instead, left on until the nozzle and piping are to be "mated."

9. No cell work, except for welding, is to be done during converter installation if that work requires turning off the cell purge (or whatever other means is used to protect the converter interior), or in any way limits the efectiveness of the converter interior protection method. This means, for instance, that the recycle cooler and block valves must be, and remain, in place during all converter installations.

10. As soon as possible after installation of the last converter and initial welding of all flanges, the cell must be blown down and purged with dry air.

TOOLS, EQUIPMENT, AND MATERIAL REQUIRED FOR ONE CONVERTER

Separate page

NO.	
1	6' ladder
2	8' ladder
1 roll	Green plastic tape (Stores Cat. No. 10-760-6325-3")
1 roll	Tie-wire (5# coil)
1	480 volt to 440 volt transformer/cart
4	Dust-type respirators
1	Vise-Grip pliers
2	Electric light/extension cord
2	Sockets, 11/16" - 1/2" drive

2		Box sockets, 13/16" - 1/2" drive
1		Special pipe jack
1		H & M burner
4		Two-ton Come-Alongs
4		1/2" x 8' chokers
1		Aluminum work basket
2		Oxyacetylene torch outfits on carts
2		Fans
2		Arc welding machines on carts
3		Welders' outfits (brushes, hammers, masks, and gloves)
50	lbs.	Welding rod
2		5' pry bars
1		Disc grinder, electric (including 6 Prefax discs)
1		100' Extension cord, 4 outlets
25		2" C clamps
1		Sheet metal cover (for "A" nozzle)
1		Sheet metal cover (for "B" nozzle)
1		Sheet metal cover (for "C" nozzle)
4		Mechanics' masks (full-face respirator protection)
3		Welders' masks (full-face respirator protection)
1	pr.	Converter lifting fixture
1		2-Way spreader (for handling cell covers)
3		Goggles or face shields (for grinding)
1		Vacuum cleaner
3	lbs.	Clean rags
3		Ladder platforms (for welders)
8		5/8" x 16" bolts (for expansion joints)
1		Plumb bob
2		12" chill rings (optional)
1		Shower cap (for "A" nozzle)
1		Shower cap (for "B" nozzle)
1		Shower cap (for "C" nozzle)

F. PROCEDURE

A. Preparation and Requirements for Single Converter Changeout

NOTE: Cascade Operations personnel purges the cell for converter change before permits are issued.

a. Obtain permits from Cascade Operations before starting a converter change.

b. Record the following information on the Process Converter - Field Data card UCN-11968 (Fig. 1):

1) Building
2) Unit
3) Cell
4) Stage
5) Date

UCN-11968 (1 5-76)

PROCESS CONVERTERS - FIELD DATA

BLDG.	UNIT	CELL	STAGE	SUPERVISOR:	DATE:

REMOVAL		INSTALLATION	
SERIAL NO.	PROPERTY NO.	SERIAL NO.	PROPERTY NO.

REASON:
- ☐ Coolant Leak
- ☐ Plugging
- ☐ Damaged Tube Sheet
- ☐ Uprating Program
- ☐ Other_____

COMMENTS:

REASON:
- ☐ Replace Failed Converter
- ☐ CIP/CUP Program
- ☐ Plant Test Program
- ☐ Other_____

COMMENTS:

FIG. 1 PROCESS CONVERTERS - FIELD DATA CARD

3. Remove cell top covers over work area, using a 2-way spreader and an overhead crane.

4. Remove bolts from side panel of cell adjacent to compressor nearest converter to be changed.

5. Remove side panel and set aside.

6. Place two 42-inch fans on floor to blow air into the cell housing openings.

   NOTE: This allows the smoke and hot air to move up through the top of the cell.

7. Connect arc welding machine to 480-volt transformer wagon; then connect wagon to a building outlet (200-amp service). Each welding machine must have enough cable for welder to move around freely without obstruction.

8. Use asbestos cloth and cover the expansion joints, instruments, and instrument lines near the cutting and welding operations area. This keeps hot slag from burning through the thin metal joints and lines.

B. <u>Removal of PG and Coolant Lines</u>

1. Install 5/8" x 16" bolts in the lugs on the PG line expansion joints as follows:

   a) 24" and 36" joints- use three bolts in the 6 lugs.

   b) Tighten bolts just enough to start to compress the expansion joint.

2. Position and install come-along from "H" beam of cell housing, or pipe stand jack to support cell piping while scarfing.

   NOTE: Install pipe stand jack under the "A" and "C" pipeline.

3. Connect choker around coolant inlet line as follows:

   a) Loop one end of a 1/2" x 8' choker around the coolant inlet line (bottom line on converter) at a location adjacent to the point of severance. Hook other end of choker to a come-along.

   b) Hook one end of 1/2" x 4' choker to the come-along and fasten other end to the nearest rigid rupport. This is necessary to pull the coolant line apart when lifting the converter.

4. Repeat step 3 for coolant outlet line (top line).

5. Separate converter from stage piping as follows:

   a) Scarf PG piping at each connecting flange joint nearest converter. Refer to MEP-82 for flame gouging welded flanged joints.

   b) Cut coolant piping at the weld which joins the stage line to the converter connection.

      CAUTION: Watch for movement of coolant line after scarfing. Stand clear of piping when making final cut.

6. Jack each severed coolant line clear with the attached come-along.

7. To allow clearance between PG line and converter flange, tighten the bolts in the lugs located around each expansion joint.

B. Remove Converter (Fig. 2)

1. Using the overhead crane, attach converter lifting fixture to the converter.

2. Lift converter free of base. Make sure the converter stays level while raising it clear of PG lines.

   NOTE: Adjust the lifting fixture to keep the converter level prior to its being raised clear of the PG lines.

3. Install shower cap over each stage PG pipe opening immediately after converter removal.

4. Record the following information requested on the Process Converter - Field Data Card:

   a) Serial and property number of the converter removed.

   b) Reason for removal of the converter.

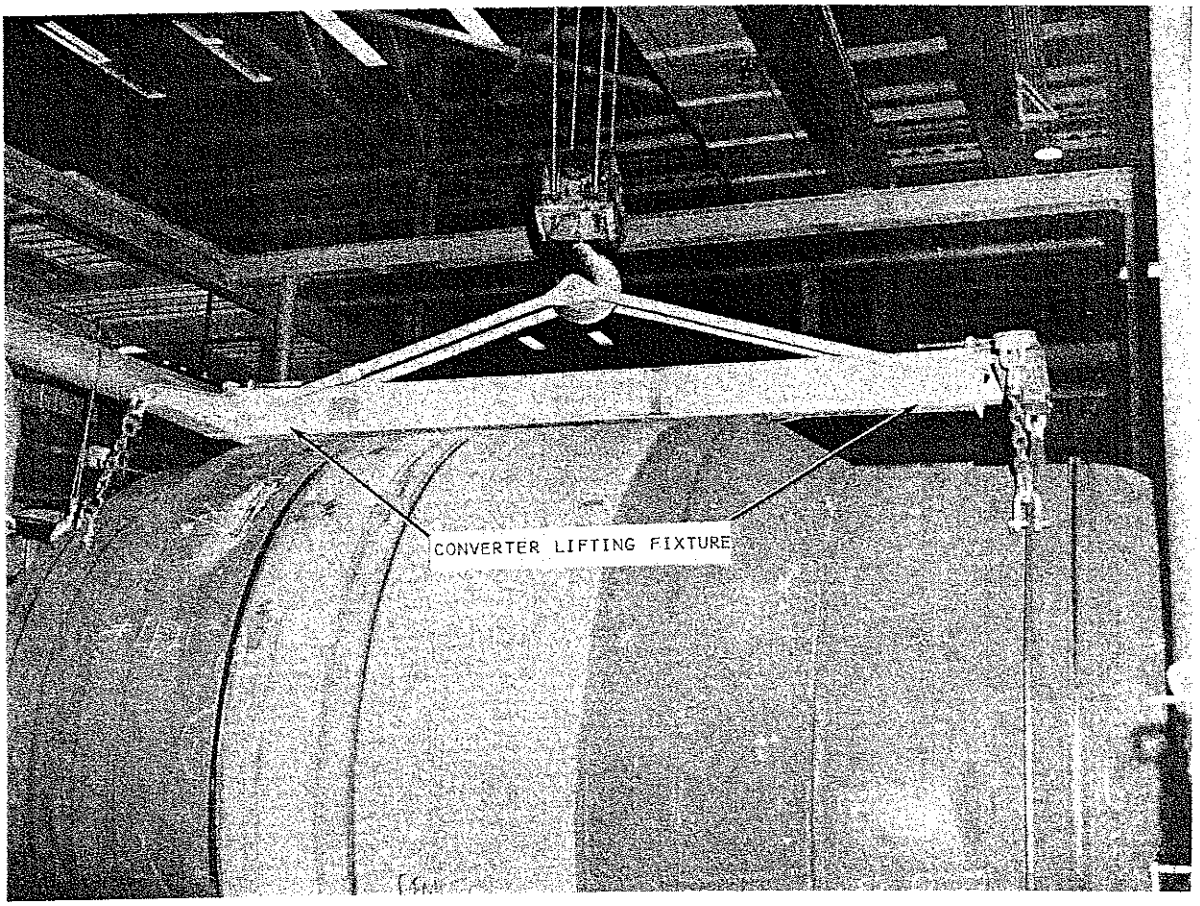

FIG. 2. CONVERTER REMOVAL

5. Install metal cover with green tape over each flanged converter nozzle if converter is going to retubing area. Secure each cover in place with "C" clamps. If converter components are reusable, treat with a buffer (Fig. 3). Refer to KDG-500, Part 4-A1 and KY-D-3490.

6. Place shower caps over the converter coolant inlet and outlet nozzles. It is absolutely a must to secure shower cap in place with green tape.

NOTE: If converter is stored on K-31 cell floor, use special wooden cell floor saddles. When converter is removed directly from the building, move it to building hatch and lower onto a converter wagon. Transport it to the designated area according to MEP-329.

4. Preparation of Stage for Converter Installation

A. Recondition each flange on PG piping which connects to the converter:

1) Decontaminate all PG flanges (Chemical Operations personnel).

2) Prepare edge of flange for standard butt weld joint (UCN W-103).

3) Grind face of flange and remove approximately 1/2" of nickel plating from rim.

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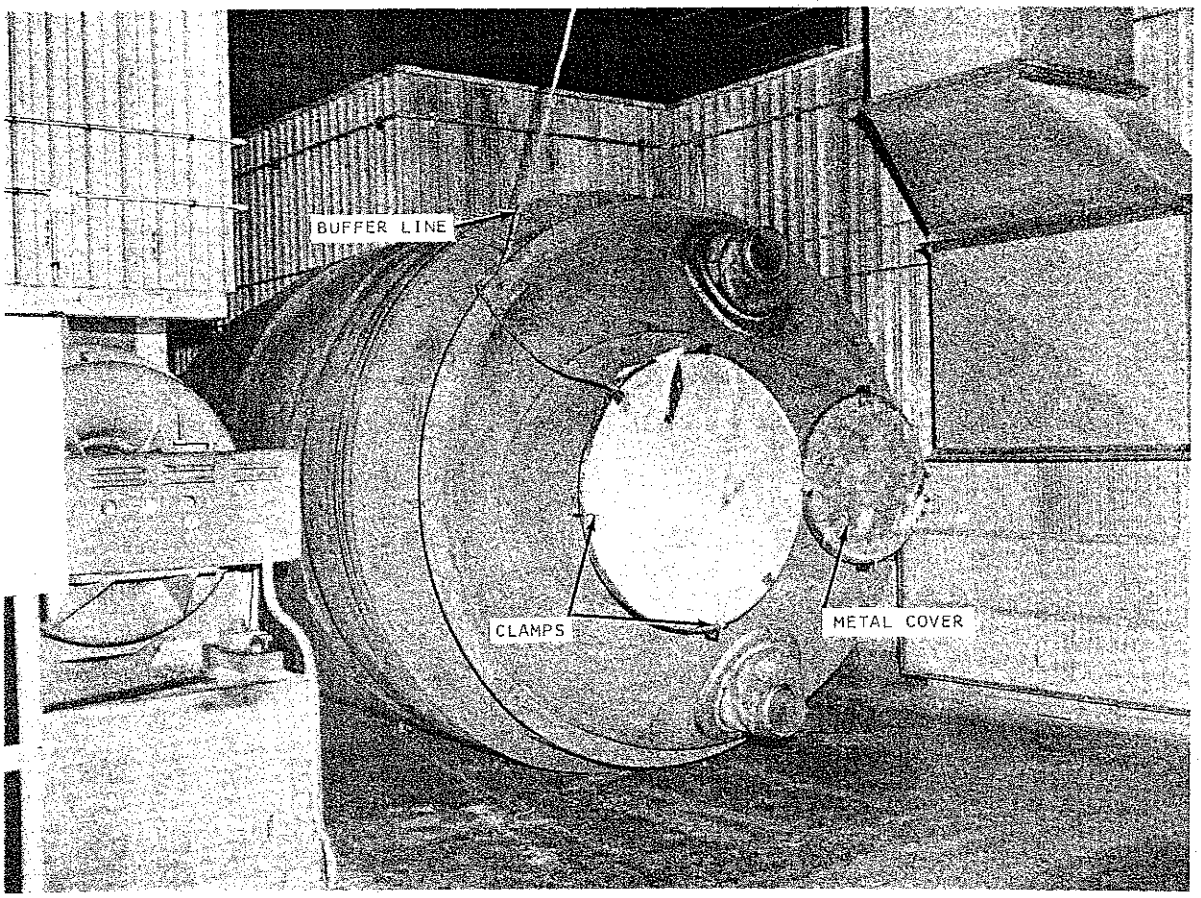

FIG. 3. TREATING CONVERTER

a. Vacuum the grinding dust from flange (Chemical Operations personnel).

CAUTION: Wear respirator and goggles during grinding and vacuuming operations.

b. Remove the metal cover from each PG pipe. (Chemical Operations personnel to vacuum interior, cleaning one pipe at a time.)

NOTE: To keep foreign matter from entering the system, do not leave cover off any longer than necessary.

c. Visually check the interior of each pipe to make certain it is free of foreign material. Keep each pipe opening covered until converter is moved to stage location.

d. Attach converter to overhead crane with special lifting fixture.

NOTE: It is important that the lifting fixture is attached properly. Installation alignment may be hampered even though the converter can be moved safely.

5. Converter Installation

~~IMPORTANT~~ NOTE: Purge valve should be open approximately 2 hours before setting converter.

a. Move converter to installation area.

b. Remove metal covers and shower caps from pipe openings at very last moment before installation.

c. Apply a small amount of grease to the converter cradles to aid in aligning the converter (Fig. 4).

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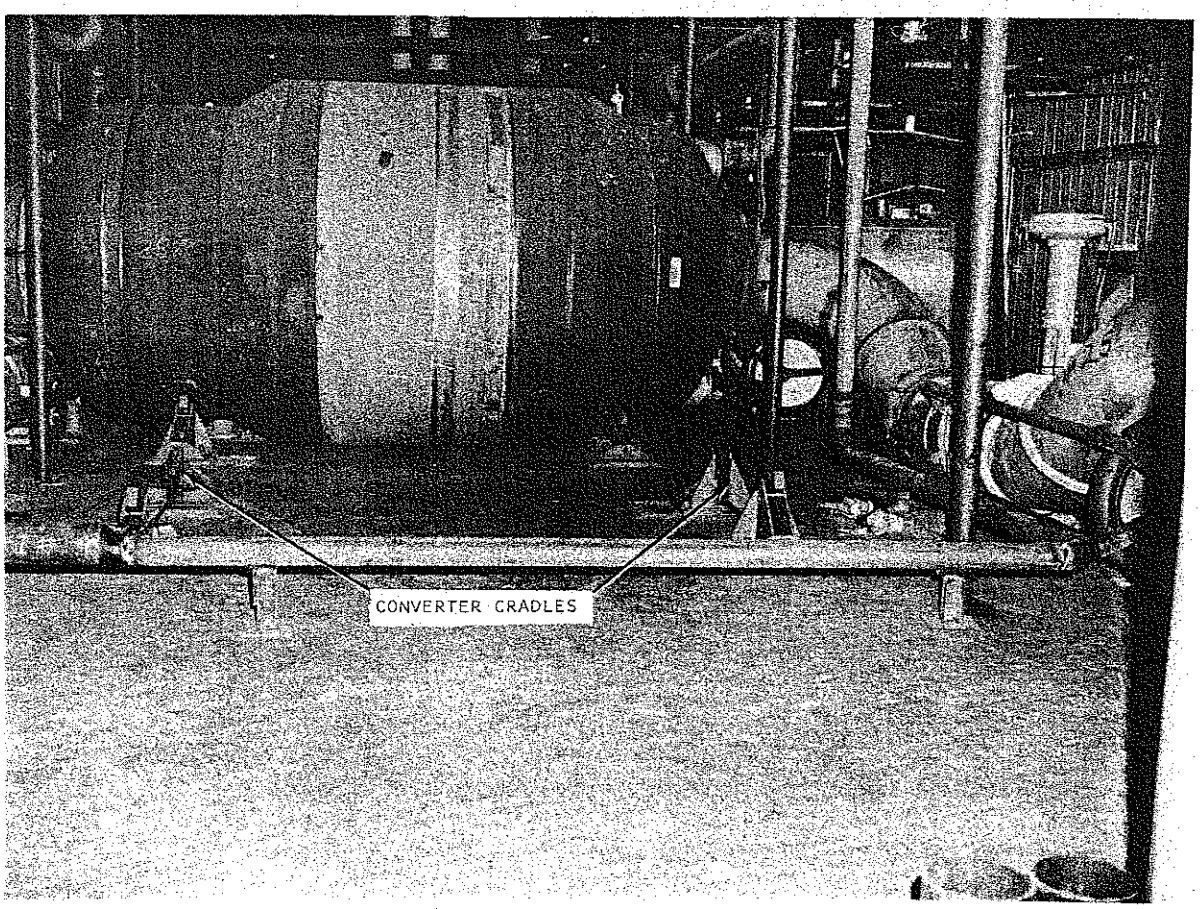

FIG. 4. CONVERTER CRADLES

d. Lower the converter into place on converter cradles and align converter stage piping as follows:

1) Converter "A" and "B" outlet nozzles to compressor "A" and "B" inlet piping. If the "B" outlet nozzle does not align, roll converter to its proper alignment position by moving overhead crane trolley either east or west.

CAUTION: Use extreme care while rolling the converter.

2) Converter "A" inlet nozzle to compressor spool piece.

3) After the converter "A" inlet, "A" outlet and "B" outlet nozzles are properly aligned, hold the alignment by adjusting the cradle if necessary (Fig. 5).

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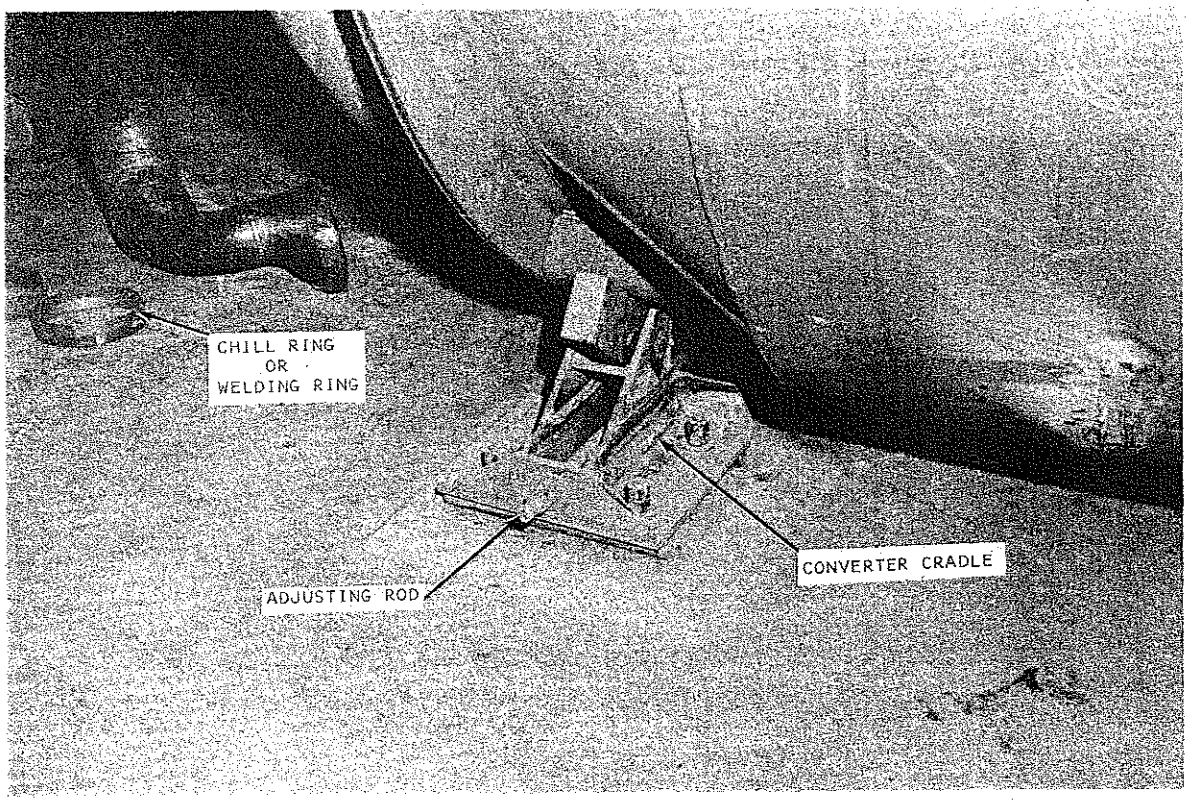

FIG. 5. ADJUSTING CONVERTER

e. Loosen 5/8" x 16" bolts from spool expansion joints.

f. Remove converter lifting fixture (Fig. 6).

g. Place "C" clamps in the order listed on each flanged joint to hold it in alignment to the stage PG piping during welding operation (Fig.6).

1) Clamp nozzle "A" inlet.

2) Clamp nozzle "A" outlet.

3) Clamp nozzle "B" outlet.

IMPORTANT: Do not use "C" clamps to force flange into position.

h. Use chill rings to align coolant inlet and outlet to stage coolant line.

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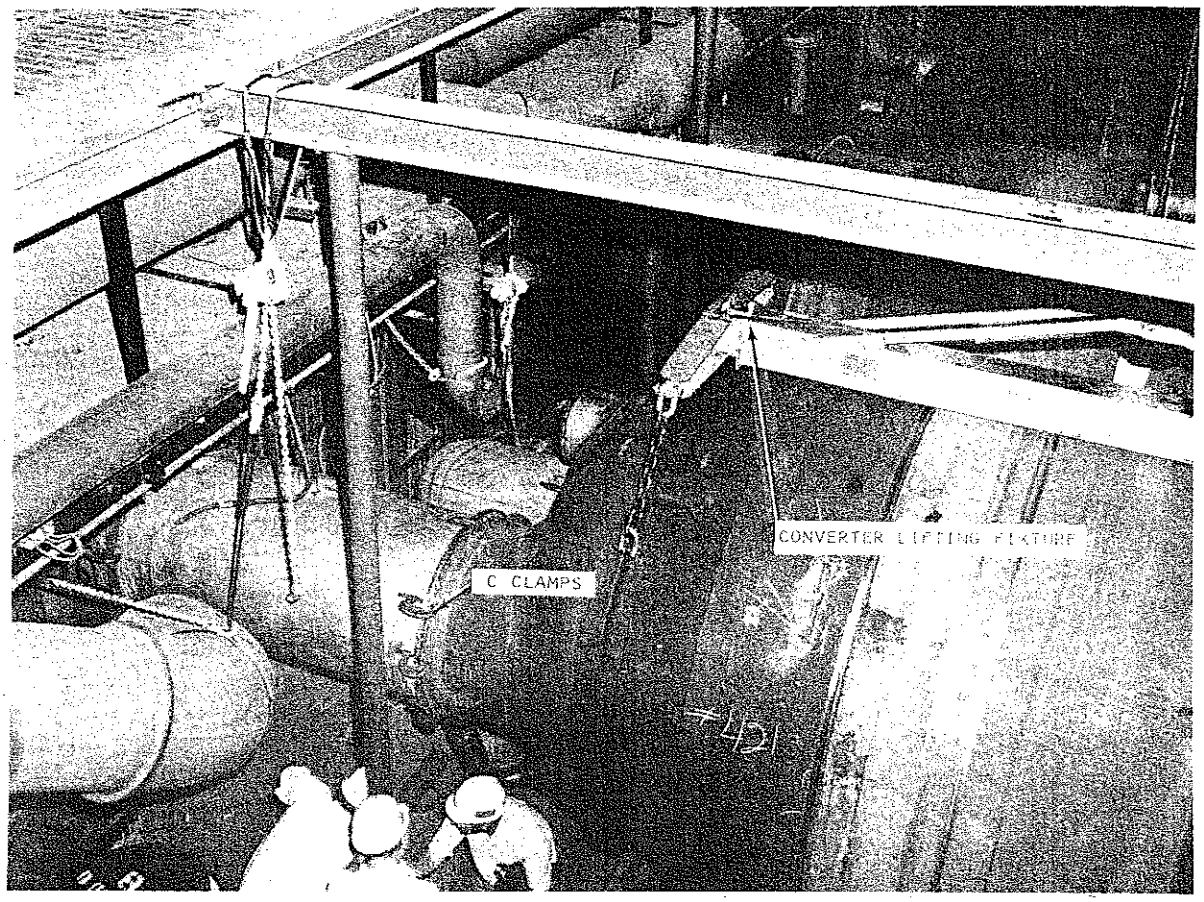

FIG. 6. CONVERTER INSTALLATION

b. Welding

a. Prepare each flange and each coolant joint for a standard butt weld (UCN W-103).

b. Tack weld each joint with a minimum of four 3" tack welds at 90° intervals and remove "C" clamps.

c. Metallic arc weld each joint. Use ASTM 7016 or 7018 rod per UCN W-103. As an alternate, short-arc weld with E-705-4 wire per UCN W-123.

d. Remove slag from weld with a wire brush to assure good leak test.

e. Each welder stencils each joint.

f. Miscellaneous

a. Record the converter serial and property numbers on the Process Converter - Field Data card.

b. Release coolant system Safety Work Permit to Operations.

c. Remove tools, equipment, and material, except one arc welding machine and one oxyacetylene outfit.

d. Notify Cascade Operations personnel that converter installation is complete. Request Operations to pressure test each weld for leaks.

e. Complete and release remaining work permits.

f. Repair leaks as requested by Operations Division personnel.

g. When Operations notifies that stage is ready for operation, disconnect and remove the following:

   1) Two fans.

   2) Remaining equipment and any foreign material, tools, or fixtures from the cell.

h. Replace the cell covers.

i. Clean up the area in and around the cell and replace bolted doors.

j. Supervisor-in-charge signs the Process Converter - Field Data card and forwards card to Maintenance Engineering.